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SPASTICITY AND THE INTELLECT

Dr. Little versus the Obstetricians

The Late HECTOR CHARLES CAMERON, M.D.Camb., F.R.C.P.
One time Physician in Charge of Department of Disease of Children, Guy's Hospital, London.

How Little at last drew the attention of obstetricians to his views on the cause of spastic diplegia; followed by an account of Lord Byron's lameness, which, in Dr. Cameron's opinion, was due to spastic paraplegia and not to club-foot.

IN that amazing work, *Tristram Shandy*, written nearly 200 years ago, Laurence Sterne makes play with the possibilities of damage to the brain of the newborn as a result of difficult labour. Dr. Slop, confidently brandishing the newly-discovered midwifery forceps, tells Uncle Toby that he wonders how the world was peopled before their aid was available. "We had," he keeps reminding Dr. Slop, "prodigious armies in Flanders." With or without the new forceps, a distressingly high mortality among both mothers and infants continued to be the rule, and until the present century no one inquired into the fate of children who survived birth injuries but were crippled by them for life in varifying degrees.

In 1913, that great physician, Sir William Osler, always an encouraging friend to beginners, recommended me to make a special study of children with cerebral palsies—that is, of those we now call "spastics". The reason he gave was that he knew of no group of sufferers who responded more quickly to care and training; and he ended his letter by urging me to look up Little's original communication (this *Bulletin*, no. 1), which first drew the attention of the medical profession to the subject.

William John Little was a distinguished London orthopaedic surgeon, who founded the Royal Orthopaedic Hospital. He found on inquiry that many of the "spastic" children who sought his help had been born after a difficult labour—many enough to convince him that damage to the sensitive tissues of the brain was the cause of their defect. Boldly he invaded the stronghold of the obstetricians, and in 1862 he got himself invited as a guest to one of the meetings of the London Obstetric Society, where he read his classic paper on the Influence of Abnormal Labour on the Mental and Physical Condition of the Child. He claimed that in about two years he had met with some 200 cases of spastic rigidity from this cause. After describing their symptoms of spasm in arms, legs, and tongue he turned to consider the patients' intellectual functions. These, he said, were sometimes quite unimpaired. In later life the individual might acquire a fair knowledge of music, the memory was good and there was often a fair capacity for arithmetic and languages. Many of the most helpless had been "restored to considerable activity and enjoyment of life, an amelioration surprising to those who have watched."

The reaction of the listening obstetricians was one of doubt. Dr. Barnes found himself unable to discuss so novel and original an idea. Dr. Taylor-Smith would have nothing to do with the suggestion. Spastic paralysis in his opinion was caused only by difficult dentition. In general, and understandably, the speakers were careful to repudiate the implication that damage to the child's brain might be imputed in any way to their lack of skill as midwives. Most preserved silence.

It was many years before Little's views received even adequate recognition, let alone acceptance, Paediatricians, as we who specialise in the disease of children are now called, have mostly upheld Little's contention, but the opinion of neurologists has largely been adverse; they have ascribed the symptoms to faults of development, rather than to the ill-effects of pressure at birth on the circulation of blood through the brain.

In 1923 I opened a discussion on the subject at a meeting summoned for the purpose in the rooms of the Medical Society of London.* I spoke in favour of Little's views and I tried to make a clear separation between children with generalised spasticity, caused by developmental defect and almost always associated with gross mental deficiency, and children such as Little had in mind, sufferers only from that degree of backwardness which was to be explained by delay in self-education, by inability to learn by grasp and by touch. For the child with Little's disease, I said, the main pathway of self-education in early childhood was closed, for it is by grasp and touch that a little child chiefly learns, accumulating sense memories. The paths of sight and hearing, closed to Laura Bridgeman and Helen Keller, were open, but that single path by which Laura and Helen achieved so much was for the spastic at the best gravely obstructed. It is because we judge an infant's progress chiefly by the rate at which he learns to control and coördinate muscular action that the spastic infant is so often thought to be mentally deficient.

I recounted cases in which, behind a face wihch might be stiff and expressionless, despite a cry, or a laugh, not charged with emotion but uttering only a meaningless note, and with limbs that were gripped in a rigid spasm when any voluntary movement was attempted, it was possible to detect a bright inelligence and a perfect ability to understand. For instance one child had been brought to me at the age of four. His limbs showed a moderate degree of spasticity and incoördination, his face was lacking in expression, his lips were not sufficiently under control to prevent dribbling, and he could not speak. His mother, a very intelligent woman, told me that she had taken him to many doctors, all of whom had told her that the boy was mentally deficient. She could not believe that this was true. She was sure that he understood everything that was said to him as well as any child of his age and she recounted to me the devices he had hit upon to indicate his wants. Under her devoted care he gradually improved, began to speak in an exaggerated mouthing way, learned to read, and attempted to write slowly and with immense difficulty. At the age of ten he went to a small boarding school, where he was popular with the other boys, tried hard without success to join in games, often fell, and was always apt to drop and spill things. Asked by his friends why he was like this he answered that it was because he had been injured at birth; his mother had told him so. "Oh," they said, "how interesting. What happened?" At thirteen he went to a well-known public school which had agreed to take him despite his bad handwriting because of his undoubted promise as a mathematician. His mother told me that before he went one great difficulty arose: he had to learn to put on a stiff collar. At the little school only jerseys had been

worn. But, after a month's practice every evening during the holidays, he got the knack of it. At his own suggestion, too, he practised carrying a cup of water without spilling it. He said he knew he would have to be a fag and he was not happy until this disability too was overcome. He did well at school, even better at university, and is now, I believe, a research chemist.

WAS BYRON A "SPASTIC?"

As evidence that the intellectual powers of a "spastic" may not only be unimpaired but at times may reach to genius, I may perhaps quote the case of Lord Byron. In 1923, at an evening party given to fellows and their wives by the Royal Society of Medicine, I gave a lecture on the nature of Lord Byron's lameness, in which I expressed my belief that he suffered, not as has been generally assumed from a club foot, but from spastic paralegia—that is to say, from spasticity confined, as is often the case, to the legs. This is not the place to repeat all the evidence I collected but it may be of interest to summarise some of it.

As a child Byron was very backward in walking and had to be carried everywhere. At first he was taken unavailingly from doctor to doctor, but his improvement was steady and after he was twelve years old we hear no more of visits to doctors. When he became famous, public interest in the cause of his peculiar gait was intense. His contemporaries and intimates were curiously divided in opinion as to which leg was lame, a doubt which could hardly have occurred in a case of club foot. Tom Moore, his friend and biographer, Galt, the companion of his travels and also a biographer, Lady Blessington, and the Countess Albrizzi, very dear friends, state that they never knew or could make up their minds which leg was involved. His mother, who ought to have known, writing that she may obtain the advice of the great John Hunter, states definitely "it is the right foot". The Countess Guiccioli, who too ought to have known, says the left foot. Gentleman Jackson, his boxing instructor, thought it was his left. Mrs. Leigh Hunt, who was Byron's guest in Italy, was of the opinion that the left leg was shrunken but that it was not a club foot. Thorwaldsen, when about to execute the statue of the poet now in Trinity College, Cambridge, was told by Byron's most intimate friend, Hobhouse, that the lameness was in the right foot. In 1828, at the time of Byron's death, an instrument-maker who claimed to have treated Byron published in the *Lancet* a crude drawing of the left foot, grossly clubbed.

In the office of Messrs. Murray, Byron's publishers, there are preserved two surgical boots made for Byron. Both are for the right foot. They show that the right foot was not clubbed but was long and slender. It is an indication of the intensity of popular interest in the matter that the lasts on which his shoes were made were sent, as things of public interest, to Nottingham Museum. After being lost for many years they were found in a drawer with their description still attached. They are for feet well-formed and symmetrical.

Trelawny's sensational account of his investigation to settle the point, carried out on the dead body of the poet as it lay at Missolonghi, was a lie later retracted by the author himself. In 1858 he published his *Recollections of Shelley and Byron* in which he describes minutely the steps he took to carry out his unseemly task. So as to be alone with the dead Byron he feigned faintness and asked Fletcher, the watching valet, to bring him a glass of water. Then hurriedly he drew back the black pall and the white shroud and uncovered the feet and legs. "The great mystery was solved," he wrote "both his feet were clubbed and his legs withered to the knee—the form and features of an Apollo with the feet

and legs of a woodland satyr." But when he was a very old man, in his 86th year, he retracted the lie. In the new edition of his book then published there is a significant change. "I uncovered the Pilgrim's feet and was answered. It was caused by the contraction of the back sinews, what the doctors call Tendon Achilles, that prevented his heels resting on the ground and compelled him to walk on the front part of his feet. Except for this defect the feet were perfect." (Such a contraction we know is only too likely to take place in cases of spastic paraplegia unless great care is taken to prevent it.) I think Trelawny felt that he could not go down to his grave with the lie unretracted.

The contemporary descriptions of Byron's gait are compatible with spastic paraplegia but not with club foot. Lady Caroline Lamb writes of "his gliding pathetic carriage", the Countess Albrizzi of "a light and gentle undulation of his person", Trelawny attempts a more complete description.

> "During his brief and brilliant career in London it was noticed by his friends that, to hide his lameness, he always entered a room quickly, running rather than walking, and stopped himself suddenly by planting his left (the comparatively sound) foot on the ground and resting upon it. On the rare occasions when he was seen walking on the street it was observed that he walked with a peculiar gliding gait, rather than the easy lounge of the fashionable saunterer—in fact with the gait of a person walking on the balls and toes of his feet, and doing his best to hide this singular mode of progress."

No bad description, I think, of the gait characteristic of Little's disease as a chance observer might see it.

Two further points in favour of the diagnosis may be mentioned. Byron at long intervals suffered from convulsions. He himself—the harshest word always pleased him best—speaks of his "epilepsy". Secondly, his head was somewhat smaller than normal. Colonel Napier recalls how once "we tried on his hat and in a company of twelve or fourteen not one could put it on." Both these peculiarities are features of Little's disease; with club foot they have no association.

At any rate, after a careful study of all the evidence I came to the conclusion that Byron suffered from spastic paraplegia in a comparatively slight form and not from any local and obvious malformation of the foot or feet. The physical defect was limited. The spastic unresponsive limbs supported a form beautiful and strong with the head and shoulders of a young Greek god. Characteristically when he was at rest, seated or standing, nothing amiss could be detected and it was therefore seated or standing that Byron must needs appear before an audience. As a rule, when he was to meet company it was arranged that he should be in the room before the others arrived. It is surprising that he came to see himself as a being aloof and remote, immobile and tense. The romantic legend of the solitary, inscrutable Byron was in some measure due to his physical defect—a pose determined by a disability.

If, as I believe, Byron was a "spastic", the conclusion can only serve to encourage us in the belief that the brain of a "spastic" child, however delayed in its development because it is deprived of the necessary sensations and stimuli, may yet reach the heights. Nor is Byron, if he was a "spastic", by any means the only instance of a child so affected who has accomplished intellectual work of the very highest quality in spite of his defect. It is not of course suggested that all "spastic" children are clever; not even that all are coöperative and possessed of an indomitable will to overcome. What is true is that those qualities are present far more often than might be thought by those who

judge from a casual glance at the exterior and that occasionally among "spastics" a child may be found who is possessed of first-rate ability in one direction or another. We may conclude that Little was justified in maintaining that they were capable of showing "an amelioration surprising to those who have watched."

Conclusion

Little's original communication unhappily failed to rouse the medical profession's interest in the question on any great scale. Nor did my own modest efforts to obey the injunction I had received so long ago from Sir William Osler have any widespread practical result. That was to come later, in the achievements of committees and societies specially dedicated to the interests of "spastics".

* A great part of my opening paper was published in the *Lancet*, 1923, ii, 1292.

The Author

(Dr. Cameron died on April 1st, in his 80th year. The following personal note is by his friend and colleague, Mr. T. B. Layton, D.S.O., M.S., F.R.C.S.)

Of Charles Cameron I can only write as I knew him. He began life in Glasgow, where his father, Sir Hector, was Lister's assistant and successor. At Guy's, where he held a university scholarship, I remember him as a brilliant young man taking the Primary F.R.C.S., an extinct exam that had at least one good effect—it compelled its victims to learn something about structure, an asset even for embryo physicians. This is perhaps an instance of Cameron's breadth of interest. Though he was one of the founders of pædiatrics, he would remind his students that his full title was "Physician to Guy's Hospital and physician in charge of the department of diseases of children", to emphasise that his interests were not confined to one age-group. Two subjects within his specialty which keenly interested him were the mental aspect of the child in health and disease, and "cerebral palsy".

"The Nervous Child" was published in 1919, just after the First World War, in which many of us had spent five years without giving a thought to children. Cameron's book helped us to regain a balance in our approach to them when we got back to civilian practice. The only work I know that compares with it is Sir Robert Hutchinson's "The Solitary Child", but that was a single lecture, whereas Cameron's is a small but complete book, entirely based on what he had seen. He was a fine physician, and personal observations were the basis of all his teaching. On his ward rounds if a student asked Cameron about something outside his personal experience he would reply "I don't know—I have never seen it".

There was that boy at the fever hospital, in whom I had tumbled on a cerebral abscess almost by chance. When it was drained I wondered whether I had been kind in doing it, he seemed to hopelessly defective. But Cameron took charge of him and made him into a child with a beautiful mind. In face of that, what did a bit of spasticity in his feet and a little blurring of his speech matter?

Then there are his views on Byron's lameness, summarised above. I heard him give a most complete and satisfying account of it at an R.S.M. soiree—he had even borrowed Byron's boots for the occasion, from Murray's, his publishers. To my mind he proved up to the hilt that the lameness was the result of Little's disease.

To generations of students Hector Cameron left one of the most valuable legacies a doctor can have—a sound introduction to child medicine. He will rest in peace.

THE EARLY DIAGNOSIS OF CEREBRAL PALSY

R. S. ILLINGWORTH,

M.D. Leeds, F.R.C.P., D.P.H., D.C.H.

Professor of Child Health, The University of Sheffield.

INTRODUCTION

In my opinion the literature concerning the early diagnosis of cerebral palsy is confusing, because for the most part it does not take into account the different types of cerebral palsy, the widely differing degrees of severity, and the widely differing levels of intelligence. I also feel that some workers have confused the issue by expressing the view that the numerous primitive reflexes exhibited by severe cases constitute an essential part of the diagnosis.

As for the first of these criticisms, it is essential to deal with each type of cerebral palsy separately, because the physical signs are completely different. One cannot, for instance, give the early signs of the athetoid and the spastic forms of cerebral palsy as if they were the same. As for the different degrees of cerebral palsy, it should be recognised straight away that it is impossible to diagnose the mildest forms of cerebral palsy in the first few months of life. The severe forms, however, with the possible exception of athetoid cerebral palsy, should be readily diagnosed in the first few weeks of life. The level of intelligence is of fundamental importance, because it has a profound effect on the child's general and motor development, and, in view of the fact that 50% of children with cerebral palsy have an I.Q. of less than 70, it follows that the majority of children with cerebral palsy will show retardation of motor development in addition to the specific signs of cerebral palsy. With the occasional exception of the tonic neck reflex and the grasp reflex, I do not regard the various primitive reflexes as of value in diagnosis, though they may be of considerable interest to the neurologist. If they are present, the diagnosis is usually already obvious on account of more readily elicited physical signs. They do not help in those cases in which there is doubt about the diagnosis.

THE HISTORY

The history is of some value in diagnosis and certainly of considerable value in assessing the child's intelligence. Firstly, one obtains the history of antenatal and natal factors which are known to occur more commonly in cases of cerebral palsy than in the normal population. These include prematurity, multiple pregnancy, maternal toxæmia, antepartum hæmorrhage, abnormal delivery, anoxia at birth, hæmolytic disease, and hyperbilirubinæmia in association with prematurity or excessive doses of vitamin K. With the exception of the last, the vast majority of children delivered after such factors have operated are entirely normal, so that too much importance must not be laid on them. The same applies to anoxia at birth: but the importance of this lies in the fact that if a child is affected, its cerebral palsy is likely to take the athetoid form.

The developmental history is important, in that mental retardation is so common in cerebral palsy that retarded development in an infant should always make one look particularly carefully for signs of cerebral palsy: and the developmental history helps one to recognise retardation.

One would ask the age at which the child first began to smile when the mother talked to him (average 6 weeks), to play with a rattle placed in his hand and turn his head to sound (average 3 months), to go for objects and get them (average 5 months), to sit on the floor for a few seconds without support (average 7 months), and so on.

THE EXAMINATION

The most important single sign in cerebral palsy is retarded development. It is very unusual for a child to have cerebral palsy of prenatal or natal origin without such retardation. An occasional athetoid child has normal motor development until athetoid movements begin. A child with tremor may have normal motor development. Otherwise there is almost always motor retardation. *The essential feature, therefore, which makes one look for cerebral palsy is developmental retardation.* The commonest cause of such retardation is mental deficiency: the second commonest cause is cerebral palsy with or without mental deficiency. It is my routine practice in examining any baby to test his motor development. This is not the place to discuss the techniques of such testing: I have summarised it elsewhere.* Having found developmental retardation, the next step is to look for specific signs of cerebral palsy. Here one must consider the different types.

(1) *The Spastic Form.*

The signs to look for in the infant are:

(a) Exaggeration of the knee-jerk.

(b) Ankle clonus.

(c) Adductor spasm of the thighs.

(d) Spasm of the hamstrings when the child is pulled to the sitting position.

(e) The clenched position of the hand after the age of 2-3 months.

(f) After the age of 6 months, the typical spastic approach of the hand to an object—dorsiflexion of the wrist and splaying out of the fingers.

(g) Possibly the persistent grasp and tonic neck reflex after the age of 3 months.

Of all these, exaggeration of the knee-jerk is the most important sign. In disorders of the pyramidal tract the area over which the knee-jerk is obtained is greatly increased. Hence I always begin by tapping over the dorsum of the foot. If a brisk response is obtained there, one can say that the knee-jerk is increased. Of course, the assessment of the degree of response is a matter of experience. One important thing is to become conversant with the normal first, so that one can recognise the abnormal when one meets it. Obviously the jerks will be asymmetrical if there is a hemiplegia.

Ankle clonus is a useful sign to look for in an infant. It is tested for with one finger with considerable gentleness.

The adductor spasm of the hip muscle is tested for by flexing the hip to a right angle and then rapidly abducting it. Limited abduction may be due to a congenital dislocation of the hip. Once more, one has to learn to distinguish the normal from the abnormal, and that is not always easy.

It is useful to place one's hand in the popliteal space to feel for spasm of the hamstrings when one pulls the child to the sitting position.

The persistently clenched hand of a spastic child is an important and obvious sign. Obviously it will not be found in

*Illingworth, R.S. (1957) *The Normal Child* 2nd Ed. London: Churchill.

a child with paraplegia. It is a sign which the mother herself often notices. (The hands should be loosely open after two or three months in a normal child.)

The characteristic approach of the spastic hand to an object is always looked for. I always begin the examination of a backward older child by giving him some bricks to play with, for one can tell in a few seconds by this test whether his hands are spastic or not. By this means one can immediately eliminate hemiplegia and quadriplegia, athetoid movements or ataxia.

The plantar response is of no value for early diagnosis.

(2) *The Athetoid Form.*

The athetoid form of cerebral palsy cannot be diagnosed with certainty until the athetoid movements are observed, and these may be delayed for 3 or 4 years or more. Athetoid cerebral palsy may be suspected in a child known to have had an improperly treated hæmolytic disease of the newborn or hyperbilirubinæmia, or who was very severely anoxic at birth, and who is subsequently found to have delayed motor development. But the diagnosis cannot be made with any certainty until the characteristic athetoid movements are seen. These are best brought out by giving the child something to do, such as a tower of bricks to build.

(3) *The Ataxic Form.*

This cannot be diagnosed until some time after the child has learnt to grasp objects voluntarily (i.e., after the age of 4 or 5 months in a child of average intelligence). Later the ataxic gait will be noticed.

Tremor.

This may be noted quite early, but it is not likely to be seen until the child is able to sit unsupported.

Rigidity.

This may be diagnosed in the first few days of life. The limbs are stiff. The knee-jerks are normal. Gross retardation of motor development is soon manifest (e.g., by 6 weeks), for these children are almost invariably mentally defective.

SUMMARY

The first essential in the early diagnosis of cerebral palsy is a thorough knowledge of the normal, and a routine but brief developmental examination of all babies seen in a clinic or hospital. By such an examination cases of developmental retardation will be found.

When developmental retardation is found the characteristic signs of cerebral palsy are looked for. In the case of the spastic form, the cardinal sign is exaggeration of the knee-jerks. Adductor spasm of the hip is also important. Ankle clonus is a valuable sign, though not frequently found. Abnormal extension of the legs when the child is held with one's hands in his axillæ is found in severe cases. Persistence of the clenched hand after the hands should be open is an important sign after 2-3 months of age. Later the typical spastic approach of the hands to an object is an invaluable sign.

Athetoid cerebral palsy cannot be diagnosed till athetoid movements are seen, though it may be suspected before that.

Ataxia can only be diagnosed after 5-6 months.

Rigidity can be diagnosed in the first few days.

SOME SPECIAL LEARNING DIFFICULTIES OF CEREBRAL PALSIED CHILDREN

How teachers may recognise them and help children to cope with them.

JESSIE M. WILLIAMS, M.A.
Senior Psychologist, Guy's Hospital, London.

Introduction

The term cerebral palsied is used to describe children who have a persisting disorder of movement appearing before the age of three years and due to non-progressive damage of the brain. Such brain damage may occur during development before birth, at or around the time of birth, or from some non-progressive disorder of the brain in the first year or so of life.

The disorder is usually classified by the particular disorder of movement because different disorders require different methods of treatment, but it is very important indeed that each child with cerebral palsy is fully assessed not only from the point of view of (1) the disorder of movement but also as regards:

(2) any disorder of special senses, sight, hearing, etc.;
(3) any epileptic disorder;
(4) any speech disorder;
(5) any disorder of intelligence;
(5) any emotional disorder.

For it is the whole child who is to be helped and his difficulties in one field will react on those in another.

This article deals with some special learning difficulties of cerebral palsied children, describing them and suggesting how teachers can help children to cope with such difficulties.

Types of cerebral palsy

A brief note on the common types of cerebral palsy is given here. There are three main types:—

(1) *Children with* hemiplegia, *forming about a third of all cases of cerebral palsy. In these, the arm and leg of one side are affected.*
(2) *Children with* bilateral spasticity, *forming about two-fifths of all cases. In these the upper and lower limbs on both sides are affected. The limbs are "spastic" and move slowly and the muscles of the neck and trunk are weak, so the limbs are stiff and the neck and body floppy. Within this group there are children in whom the lower limbs are more affected than the upper—in some children the lower limbs alone seem affected—and there are children in whom the upper limbs are more affected than the lower, a condition often accompanied by spasticity or stiffness of the muscles of speech and swallowing.*
(3) *Children with* unwanted movements, *forming about one-seventh of all cases. The movements are usually quick and are generally more obvious in the face, which is "over expressive", and the upper limbs, the lower limbs often being less disordered. These children are often called* athetoids.

The remainder form a heterogeneous group of children with uncommon types of cerebral palsy — ataxia, hypotonia, mixed cases and cases difficult to classify. Each type is so uncommon that it does not warrant detailed description here.

In our present state of knowledge, it seems that the special learning difficulties we are about to discuss are most common in the children with bilateral spasticity. Teachers of cerebral palsied children have opportunities to observe whether this is so and add to our existing knowledge of the correlation, if there is any, between the various difficulties of learning and the various types of cerebral palsy.

This article is primarily concerned with specific learning disabilities. These are fairly common in children with cerebral palsy, but cases of such learning disabilities have more recently been recognised in children without cerebral palsy and without any history of illness in fœtal life, failure to breathe well at birth, jaundice just after birth, brain disorder in early life, or other events which might have produced brain damage. The specific learning disabilities are sometimes assumed to be due to brain damage. This is not an altogether unreasonable assumption, for in many cases of spastic cerebral palsy there is no obvious event in the child's life story that one can point to as having been the cause of the brain damage revealed by the disorder of movement.

It is not surprising that, if a brain is so injured that disorder of movement results, other defects will commonly be present too, for it is to be expected that other parts of the brain might suffer from the injury which affected the part controlling movement. The results of brain damage can also be seen therefore in the physical disabilities such as deafness or partial deafness, defective vision, squints or defective speech which commonly accompany cerebral palsy. We have especially to note that many brain-damaged children, but by no means all, fall in the category of "Educationally subnormal," or, in some cases, "ineducable children".

Cerebral palsied children can be found, therefore, in normal schools, special schools for E.S.N. children, schools for the physically handicapped, schools for partially sighted or blind children, schools for deaf children, and schools for delicate children. The limitations imposed by their varying physical disabilities can be fairly clearly recognised by the teachers of such children, who can then plan a learning programme modified to meet their physical needs.

It is however not always recognised that, for many of these children, the effects of the brain damage are not limited to defects of movements, special senses, speech or overall intelligence. Nor is it always the case that the picture can be clarified for the teacher by adding to the information on the child's physical disability a carefully reached assessment of the child's intelligence by standard methods of testing.

Although it is true that many cerebral palsied children suffer a general all round lowering of mental ability, it is also true that others suffer from special learning disabilities which can prove very baffling to the teacher who is unaware of them.

The purpose of this article is to set out some of the more usual ways in which this brain damage hinders learning and to suggest means by which these children can be helped to circumvent their impairment.

At the start it is important to appreciate that although the kind of learning disabilities from which these children suffer may be present in children who are mentally subnormal they may also occur in children who are potentially of average, or above average, intelligence. Moreover, if the disability is severe, and is not recognised and understood by the teacher, it not only in itself constitutes a serious obstacle to learning but it also can create for the child much frustration, emotional distress, and anxiety which will in turn adversely affect, and impede, learning.

Perception

The special learning disabilities of these children are related primarily to disorders in their mode of perceiving. All the stimuli impinging on our senses from the outside

world become meaningful for us through the integrative action of our brain. Perception has been described by Strauss and Lehtinen (1947) "as the mental process which gives particular meaning and significance to a given sensation and therefore acts as the preliminary to thinking. It is the means by which the individual organises and comes to understand the phenomena which constantly impinge upon him."

Our knowledge of the world we live in is gained primarily through our senses, mainly sight, hearing and, particularly for young children, the sense of touch. Our capacity to relate ourselves to our world and cope with the demands it makes on us develops as we grow in our understanding of it. The teacher of young children knows that no child is ready to begin formal learning until he has had ample opportunity to learn about his world through his own exploration of it. It is through his sensory experience that a young child gains knowledge of size and shape and distance, of degrees of temperature and intensities of sound, of the differences between things that feel rough or smooth, hard or soft. He gradually learns about position. One subject is nearer to him than another. He can reach out and pick up one, but in order to grasp another that is further away he must move towards it.

It is not possible for anyone to take equal notice of all the sights and sounds that impinge on the senses at any given moment. It is part of the action of our brain to select from all these varying sensations what is important and meaningful for us at that time, and to relegate the less important to the background of our consciousness. This is the only way by which we can develop the power to concentrate on what is significant for us at any given time.

Like all human skills, this ability to organise for ourselves a stable and understandable perceptual world is subject to maturation and developmental growth. The very young child easily misjudges the distance of his head from the table and is more subject to bumps in consequence. He is less able to recognise and match differing colours and shapes. He cannot concentrate on any one task for long for he is easily distracted by all the sights and noises and movement around him.

Even though they can see and hear and touch, many cerebral palsied children remain unable to integrate and find meaning in all the sensations that they experience And they suffer much confusion in consequence.

It cannot be too strongly stressed that *all* cerebral palsied children do not suffer *all* these difficulties in perceiving, and that they do not affect with equal severity all who do have them. But there are some characteristic disabilities of which the teacher of cerebral palsied children should be aware, particularly when it is found, as it often is, that an apparently normally intelligent child is having great difficulty in learning to read, write, spell or understand and manipulate numbers.

Many cerebral palsied children have a great deal of difficulty in appreciating spatial relationships. This is seen for some in their inability to recognise shapes and patterns. Given a number of shapes, some round, some square, some triangular, some diamond-shaped, these children cannot sort and match them according to their shape. This kind of task—the Recognition of Forms—occurs at the four-year level in the Stanford Binet Intelligence Scale. I recently examined a cerebral palsied boy aged 8¼, with only slight physical handicap, whose intelligence quotient on that scale was 95, but who found this test item quite beyond him. This boy had been referred for psychological examination because he had made no beginning in reading, though he seemed to his teacher reasonably intelligent.

Some children can match shapes and letters but cannot reproduce them from memory, while some can reproduce from memory but cannot copy. Some children who can copy printed patterns find it extremely difficult to copy even the simpliest structure built in bricks or put together a simple jig-saw type of puzzle consisting of only two or three pieces, even when shown the completed puzzle first.

A normally developing child of 7 years can copy a diamond. Fig. 1 shows the attempts made by the boy of 8½ who found it so difficult to match shapes. Fig. 2 shows a comparable attempt by an 8-year-old cerebral palsied boy of average intelligence.

Children with such difficulty in recognising shapes, and possibly also in producing and/or copying shapes and forms, will inevitably approach the special task of learning to read and write with quite serious handicaps from the start.

Some cerebral palsied children have great difficulty in recognising position. They easily become confused between left and right, up and down, above and below, in front of and behind. These children often find it impossibly difficult to set down a simple sum and have no idea how to put units beneath each other in a column and tens below tens. Often the same children can work out sums of equal difficulty quickly and correctly in their heads but cannot set them down on paper. This creates a real problem for teachers who have such a child in their class, and who must on occasion find some method by which he can be left with an individual assignment.

Even though they can see each object clearly, some cerebral palsied children have no idea of the distance of one object from another or from themselves. Similarly in looking at a picture they cannot distinguish the foreground from the background and many find it very difficult indeed to interpret pictures. It is probably this difficulty in seeing things in perspective that makes it almost impossible for some cerebral palsied children to translate the two-dimensional representation of a drawing into the three-dimensional objects of real life. A normally developing young child, for example, quickly learns to pick out the "doggie" and the "pussy" in a picture, knowing it to be a representation of the doggie or pussy he knows in reality. But some cerebral palsied children even of the age of 8 or 9 find this very difficult to do.

All these perceptual disorders create, for children who have them, difficulty in patterning their world. We develop an understanding of our world in terms of space and time. It is through visual perception that we can formulate for ourselves a spatial world based on our recognition of spatial relations.

Studies of ways in which we organise and pattern our world suggest that the position of an object in space is probably related to our own self as a point of reference. It is only very gradually that a baby becomes aware of himself as a being separate from his mother who nurses him. A young baby will lie in his pram watching with delight the movements of his own legs or arms without any awareness that they are part of himself. Gradually, through all our interrelated sensations we build an image of ourselves. This "body-image" develops and changes as we ourselves develop and change. And it is at first closely correlated with sensory-motor development.

Many studies have been made of the way in which children of different ages and levels of development draw human figures. Goodenough (1926) has used "Drawing of a Man" as a measure of mental growth in children. While it is true that drawing a person involves not only perceptual ability but also motor skill, the drawings of many cerebral palsied children who have the necessary motor co-ordination to produce a drawing

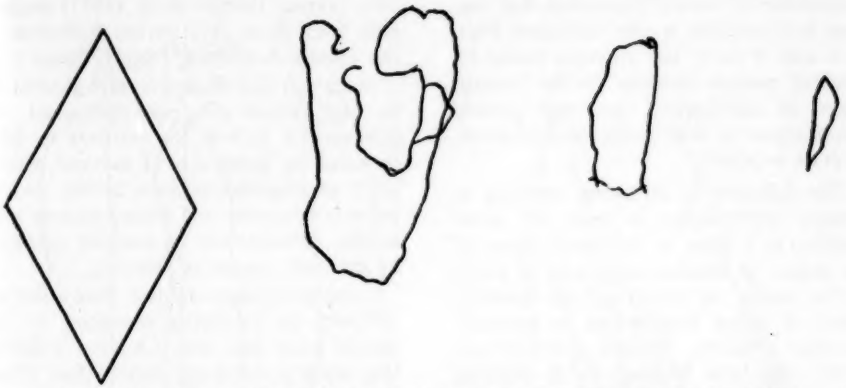

Fig. 1.—Copies of a diamond by a cerebral palsied boy, aged 8½ years, who found special difficulty in matching shapes. Stamford-Binet Scale I.Q.95.

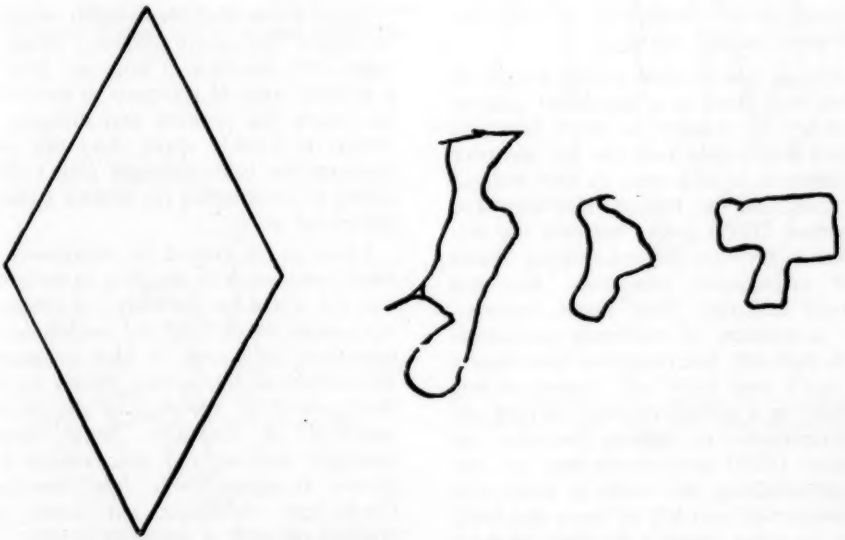

Fig. 2—Copies of a diamond by a cerebral palsied boy, aged 8 years. Stanford-Binet Scale I.Q.101.

suggest that these children not only suffer disturbance of visual perception but that their body-schema is also disturbed. Figs. 3, 4 and 5 show the attempts made by cerebral palsied children in the average range of intelligence, and not grossly handicapped in fine motor co-ordination, to draw a person.

The difficulty in attaching meaning to sensory impressions is seen for some children in a delay in the development of the ability to localise sensations of touch in the fingers. In a study of the development of finger localisation in mentally retarded children, Werner and Carrison (1942) and later Benton (1955) studying normal children showed that the capacity to know blindfold which finger is being touched develops fairly rapidly through a mental age range of 6½ to 8½ years, with a slower rate of growth from 8½ to 9½ years, attaining maturity in late childhood. It seems to be a process of maturation for normal children stimulated by their exploratory manual activity.

Strauss and Werner (1938) sought to show that there is a significant relation between the inability to locate blindfold which fingers have been touched and poor attainments in arithmetic. A later analysis of their data by Benton, Hutcheon and Seymour (1951) points out that the correlation between finger-localising ability and arithmetical attainment was not clearly indicated. They found, however, an association of moderate magnitude with right-left discrimination with respect to one's own body and finger-localising ability. In a normative study of right-left discrimination in children Swanson and Benton (1955) have shown that, as with finger-localising, the ability to distinguish between right and left on one's own body and on other people's develops progressively from the age of 5 years, reaching full maturation at about 12 years.

Some cerebral palsied children show a delay in maturation of both finger-localising ability and the ability to discriminate between right and left on their own bodies. Benton et al. (1951) suggest that both these abilities are functions of the child's developing "body image".

Since our ten fingers form for most of us our natural concrete equipment for counting, it is well for teachers to bear in mind the possibility of delayed maturation of finger-localisation ability and to provide adequate and clear concrete aids to the development of number concepts in the early stages of learning.

Some hemiplegic children have a similar difficulty in localising sensation in the spastic hand and arm. Children suffering this sensory deficiency cannot feel where the bad hand is and experience a great sense of frustration when they are forced to use it. It is often wise not to compel them to use it. The relief they experience when freed from the burden of trying to use it is frequently seen in the much more rapid progress they make.

There is considerable research evidence to suggest that where our body image is vague and distorted, it does not give us a reliable point of reference to which we can relate the position and distance of objects in outside space. And this also increases the brain-damaged child's difficulties in constructing for himself a stable perceptual world.

I have so far stressed the importance of visual perception in enabling us to structure our world but the ability to integrate and make meaningful the multitude of sensations of sound is also necessary, particularly as this relates closely to the development of speech and the understanding of language. Some brain-damaged children can hear sounds but cannot translate them into meaning. Others can understand but cannot reproduce patterns of sound in speech.

Language

Perception and language have been described by Lehtinen (1955) as constituting "the raw material of our concepts".

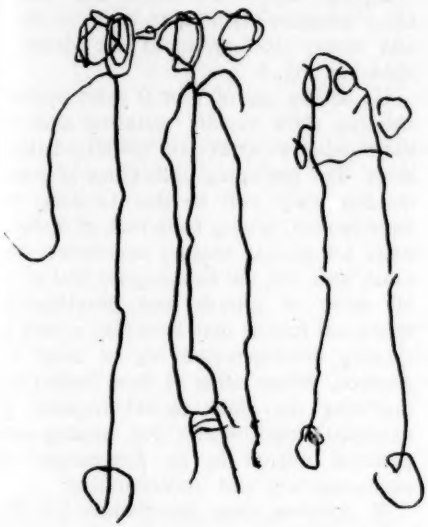

Fig. 3.—Three attempts by a cerebral palsied boy, aged 8½ years and of average intelligence, to draw a person.

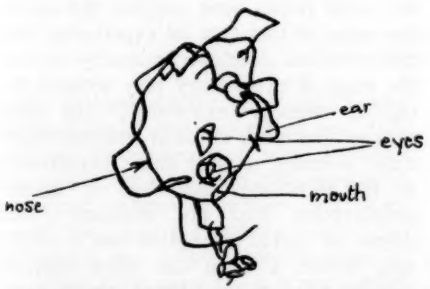

Fig. 4.—Drawing of a man by a cerebral palsied boy, aged 8 years and of average intelligence.

Fig. 5.—Drawing of a person by a cerebral palsied girl, aged 10½ years and of average intelligence.

Our perception of the world is the basis for our thinking, reasoning and forming of concepts about it. Language for a young child is a means of naming objects, verbalising their relation to other objects, and so helping to stabilise his perceptual world. An intelligent child of 2½ years, having grasped the meaning of the phrase "bigger than", spent a whole afternoon saying "Daddy bigger than Mummy"; "Me bigger than baby"—going through all the toys and objects she could name in the same way, and thus building up relations between them and developing her concept of relative size. It is only later that language becomes a tool of social communication.

Cerebral palsied children are not only variously handicapped by their difficulties in perceiving and appreciating visual patterns, and by their difficulty in integrating and patterning auditory stimuli, but many of them are late in learning to speak and are thus deprived of this use of language for naming things as a help in structuring their world.

Conversely, when they have mastered speech many cerebral palsied children are often verbally very facile. They use speech lavishly to compensate for (and hide) other defects. A 13-year-old girl, with no motor disorder of her hands but a very real drawing disability, when asked to draw a house, chattered for some time in this way before beginning to draw:—

"A house? Where shall I draw it?
Shall I put it at the side or in the middle of the page?
What kind of house would you like me to draw?
Shall I draw an ordinary house?
I think I'll draw a cottage. No, it would be better to draw a mediæval house.
Do you know what is in a mediæval house?
Well, of course, a baronial hall.

She then gave a very detailed description of life in mediæval times. In this way she delayed the moment when her almost complete incapacity to draw the house would be revealed.

During this conversation she made many tentative attempts to begin to draw and finally she produced the drawing shown in Fig. 6.

Up to the age of 7 or 8 years normal children show rapidly maturing skill in their ability to appreciate spatial relationships. The perceptual difficulties of some children may well be due to delay in development, arising from lack of opportunity for gaining sensory experience. We must, also, not fail to recognise that as in all areas of growth and development emotional factors may here play a part in causing developmental lag or even regression. Where either of these factors are operating the child should respond to extended opportunities for gaining experience offered in an atmosphere of encouragement and understanding.

If, however, these disturbances are due to permanent brain damage, ways will have to be found to help such children to compensate for their disability. It has been noticed in children severely handicapped in this way that giving extra opportunities for free play and sensory experiences is not always enough. Miss Caldwell (1956), the headmistress of a school for spastics, found that some of her older pupils soon outgrew the desire for more of this type of experience, and that they had developed mentally beyond the stage of exploratory play without acquiring sensory experience. She also noticed that some children who had sufficient mobility to gain these experiences at the right age and stage of mental development had not acquired "that degree of spatial perception that is necessary before a child can dress himself, understand a picture, draw even a symbolic shape, let alone tackle the more intricate arts of learning to read and write letters or figures. Yet many of these children were otherwise intelligent."

In a review by Senden (1932) of published reports on the development of

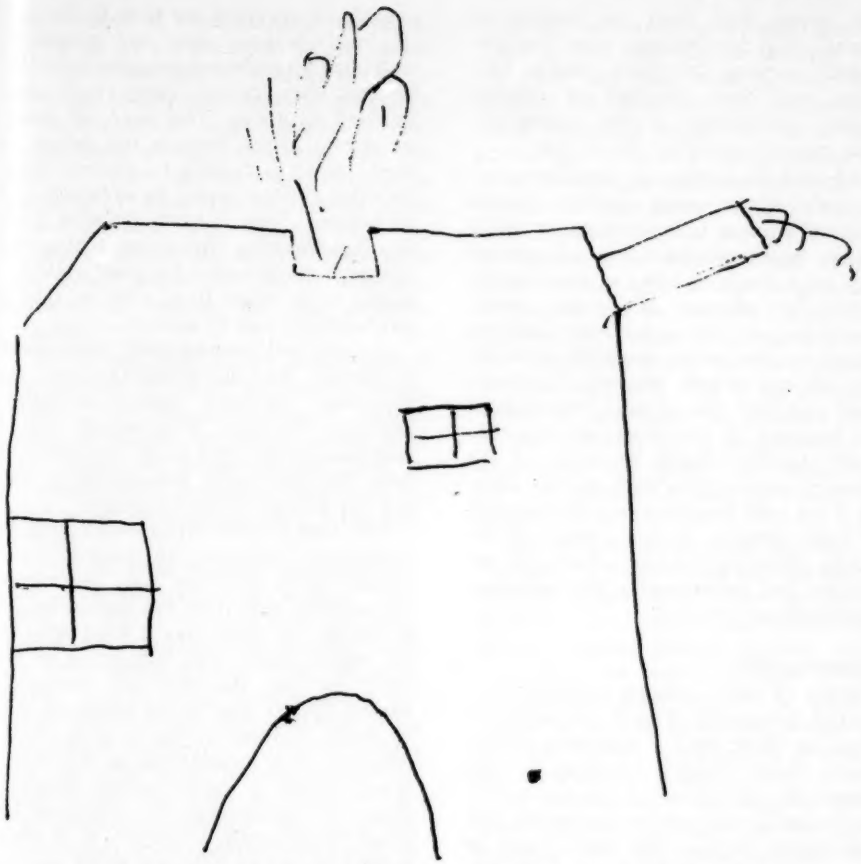

Fig. 6—Drawing of a house by a cerebral palsied girl, aged 13 years. Stanford-Binet Scale I.Q.109.

vision in congenitally blind adults who had been given sight by surgical operation and described what they saw, we learn that while they were soon able vaguely to distinguish masses or wholes, but it required long and painstaking learning to distinguish one object from another or one shape from another—a triangle from a square—or one face from another. This conclusion that ordinary visual perception is developed only through a long learning process was confirmed by Riesen (1947) in chimpanzees. Animals reared in the dark for their first two years of life showed, on being brought into the light, impairment of visual perception similar to that of Senden's patients.

The evidence brought together in these publications goes to show that the course of perceptual learning in human beings is very gradual and develops through a period of separate attention to each part or detail of a figure into the ability to recognise the whole as a whole. Only when an individual perception has been integrated or "learned" does the ability to associate and compare two separately integrated perceptions become possible.

It seems that there are periods in normal child development when this perceptual learning can most readily take place, and that, deprived of suitable sensory stimulation at the appropriate time, perceptual ability can be lost.

Whether the perceptual disorders characteristic of so many cerebral palsied children are due to brain damage which cannot be compensated for, or whether they are a result of delay in development caused by absence of normal visual stimulation at the appropriate learning period—a deprivation inevitable in children whose various physical handicaps have distorted the natural processes of development—it is important that the child's teacher should be aware of the effect of such a disability on the child, for it not only interferes with the learning of basic subjects at vital stages of the child's schooling but also affects his behaviour and consequently his happiness and emotional stability.

Distractability

Many of these children are more than usually distractable. This is not surprising when we think what a confusion is constantly being created for them by the impact of sights and sounds which they cannot easily organise into an orderly and meaningful pattern. The early stages of learning for these children can best take place in an environment where external distractions are reduced to a minimum. A normal child is stimulated and helped in his school learning by pictures and models in the classroom; for the brain-injured child in the early stages of learning such stimuli are too distracting. He works best if he can be placed in a position where he is not too much disturbed by the sight of other children, and he is helped by an orderly and simple routine the meaning and arrangement of which he can comprehend.

Some cerebral palsied children show their distractability in restlessness and hyperactivity, but others are equally incapable of attending for long to the task in hand because they are constantly distracted by irrelevant thoughts and ideas so that they cannot easily hold their thinking in focus. This kind of mind-wandering arises because the minds of these children respond to stimuli which for other children would be irrelevant and so ignored. This is quite different from the day-dreaming and fantasy that the unhappy, emotionally disturbed child indulges in to escape from a reality that is too harsh for him to tolerate.

A quiet and unstimulating atmosphere minimises the distractability, and, as behaviour becomes more controlled, learning becomes progressively more possible. As the child learns, his environment becomes more meaningful to him and his distractability diminishes.

The distractability which stems from an exaggerated response to environmental stimuli shows itself not only in restless, uncontrolled behaviour but also in failure to attend for more than a brief spell to the task in hand. The help given to the child by the reduction of distracting stimuli applies also to the materials that he uses. Pictures in the reading book, diagrams and illustrations in the workbook, usually a joy to normal children, create a bewilderment and confusion for many brain-damaged children. It is often helpful to expose only one small area of the page at a time, and screen the rest from view. Similarly, projects or group activities in the classroom are in the early stages too confusing for these children. As a general principle the range of their activity should be small and defined and temptations to wander away from the basic task should be limited.

This does not mean that motor activity as an aid to learning should be denied these children. Even though many of them are clumsy and lacking in fine co-ordination, motor activity, if it is meaningfully related to the success being learnt, often helps to hold the child's attention and deepen understanding.

For most of these children the recognition of colour seems to remain intact so that colour can be used as an aid to learning. Letters and shapes or groupings of letters can be made clearer by outlining them strongly in colour, and the use of colour can also be drawn on in learning to count and manipulate numbers. Children who cannot keep the "pattern" of tens and units in their sums are often helped by boldly coloured outlines of spaces for the different columns.

While most children are greatly helped in learning by their kinæsthetic sense, many brain-damaged children cannot easily coordinate movement with sounds and shapes. Movement patterns have to be taught slowly and often laboriously by guiding the child's hand until it becomes a habit.

Some of these children have excellent rote memories and are verbally very facile. There is a danger of confusing parrot-like repetition with learning based on real understanding. For example, Susan, aged 10 years, could repeat all her tables perfectly but when she was given this simple problem: "A bag of sweets cost 9d; how many pennies would you need to buy two bags of sweets?", she was completely defeated. She could tell you without hesitation that twice 9 is 18 but she could not relate that knowledge to solving the problem of the sweets, nor had she any conception of which was the larger number.

Perseveration

Another characteristic of many of these children is their difficulty in moving in thought from one idea to another. They have a certain mental stickiness or perseverance which makes them continue to wrestle with one idea or problem long after the teacher has moved on to something else. When testing these children it is not unusual to find them answering the question to a test item given some minutes earlier, without realising that the time for answering the question has long passed. Not only should learning tasks be short and have their pattern clearly defined, but when they are completed the child should be actively helped to move in thought to the next clearly defined task.

Brain-damaged children are often very variable in their performance. To teachers who do not appreciate this it is frequently disheartening to find that the progress and promise of one day is sometimes completely lost on the next. These children are hyper-sensitive to slight changes in their environment and are generally quickly fatiguable. This is not surprising when we remember the constant frustrations with which they must contend. On days which are clearly not "good days" for the child it is wise to modify the demands made on him.

All children respond to and are encouraged by achievement and success. To an even greater extent than for normal children it is important that these handicapped cerebral palsied children should experience the encouragement of real achievement. They should be given a chance to do one of the things they are good at, between the attempts at what is difficult and frustrating.

We need to work with what is left in these children, and find ways in which they can use their good abilities. This demands a flexible approach to teaching methods.

For example, many children with severe perceptual disorders can best learn to read by using a phonic method almost exclusively from the start. This sometimes seems like sacrilege when suggested to young teachers trained in a more modern method.

Even when it is considered to be in the child's best interests to take him through the slow and laborious process of developing visual perception, the tasks set for the child should be short and graded in difficulty. It is better for a child to succeed in, and complete, a short task than be faced with the disheartening ex-

perience of failing in a task that is too long and involved for him. It is a psychologically sound policy to try to end each learning period on a note of achievement.

Since brain-damaged children vary widely in the extent of the damage and its effect on learning ability, it is not possible to formulate a teaching programme which will be applicable to them all. It is of value, however, for the teacher to be aware of the various kinds of disabilities in perceiving, thinking and learning from which many of these children suffer in varying degrees. Knowing these, the teacher can then plan a programme suited to the individual child and avoid increasing his difficulties by making unreasonable demands on him. Tasks that present great difficulty—such as sums or drawing—may be best completely omitted for a time.

In seeking to help these children it is important to recognise always that there is no "cerebral palsied child" but a variety of cerebral palsied children whose learning problems, personalities, and ways of adjusting to the difficulties of their lives are unique for each child. It is only through patient observation and individual work with these children that a teacher can adequately formulate a suitable learning programme, using methods adapted to the separate and different needs of each child.

I should like to thank Dr. Ronald Mac Keith for his advice and encouragement in the writing of this article and particularly for his help with the introductory section.

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DEFINITIONS AND CLASSIFICATIONS

WRITING IN the *Listener*, a lawyer lately described how, while in the United States, he was asked to join a discussion. He suggested that they should start with a good clear definition of the idea to be discussed, whereupon another member protested at such a waste of time and urged that they press on with discussing the idea and its psychological causes. When a subject like cerebral palsy is under discussion there is an obvious need for defining the term, because everyone who uses it has his own views on what it stands for, but cannot be certain that it carries the same meaning for others. To attempt the definition is to realise the difficulties—it is tempting to go straight ahead with discussing classification and treatment, without "wasting time" on definition.

In a similar way, it is not difficult to devise a simple and logical classification of cases. But the beginner often finds it disappointingly difficult to use the classification. Is a child with hypotonic limbs and up-going plantar responses to be classed as spastic diplegic? When faced with such a problem the pædiatrician naturally turns to a neurological textbook. Even here he may meet trouble. Denny Brown's "Handbook of Neurological Examination" says of "spastic" hypertonus that "It is constant from hour to hour, but varies from day to day." But such constancy is uncommon in spastic hypertonus in children. The adults' neurologist has adults in mind. We need a textbook by a pædiatric neurologist. Indeed, for the last ten years pædiatricians have turned their backs on neurologists. This is a pity because they have something to teach as well as to learn.

We need not only a widely accepted system of classification but also a method of classification; and both method and schema of classification should be acceptable to neurologists as well as to pædiatricians and workers in the fields of physical medicine, orthopædics, and so on. In our present ignorance of the causes and morbid anatomy of "cerebral palsy" the only satisfactory basis for an acceptable method of classification is the clinical examination of the patient. It should be possible for two observers to agree on the signs they find, however much they disagree on the probable anatomical changes producing the signs. But our two observers will discuss the problems more easily if they agree on the meanings of certain descriptive terms. For example, "rigidity" for some people implies hypertonus with lead-pipe qualities. Is this what it means to others? From the point of view of education and employment, the term "spastic tetraplegia" has the disadvantages that it does not tell us whether the disorder of function is worse in the upper or the lower limbs. Perhaps we should use "spastic diplegia" for the latter and "double hemiplegia" for the former. These terms come from adult neurology and have a real usefulness. There is need for:

(a) a glossary of terms;
(b) a method of examination; and
(c) a classification based on these.

A start has been made, for the *Lancet* has been publishing a discussion on what is meant by "cerebral palsy". In a leader on April 19 (p.836) this was defined as "a congenital motor deficiency that is not progressive." In a subsequent letter (*Lancet*, May 3, p.961) DR. RONALD MAC KEITH and DR. PAUL POLANI recalled that cerebral palsy is a result of damage to the brain; that it is the damage and not

the motor disorder which is non-progressive; and that the palsy is usually not congenital (present at birth). They put forward the following definition of cerebral palsy, evolved in discussions at the Little Club by thirteen neurologists and pædiatricians.

"A persisting qualitative motor disorder appearing before the age of three years, due to a non-progressive disorder of the brain."

It is hoped that the memorandum from which this definition is extracted will soon be available for comment and criticism by other neurologists and pædiatricians.

PERIPHERAL SURGERY

" . . . although mechanical aids and orthopædic surgery, plus specialised physiotherapy, can do something to help, the future lies with the ability of drugs and other more radical procedures to relax hypertonic muscles and control the athetoid movements." Few would disagree with this quotation from the introduction to *C.P. Bulletin* No. 1, except perhaps to hope that the future lies with none of these therapeutic measures but with the successful prevention of cerebral palsy based on an increased knowledge of its ætiology. However, individual patients will need treatment for a long time to come, and although surgery plays only a small part in a broad programme of care, much too gloomy a view is taken of its value in the management of cerebral palsy. I am not referring to primary or "central" surgery, directed at the basic disorder in the central nervous system, but to "peripheral" surgery designed to improve the function of one or other limb.

The disappointments which followed operations in the past, and in particular the misadventures of ROYLE's sympathectomies, enveloped the surgery of limb deformities in cerebral palsy in so deep a gloom that many intelligent and persevering patients are now struggling about with grotesque deformities which would not be tolerated in any other disease.

In recent years the emphasis on conservative treatment has overwhelmed the surgical needs of C.P. patients, so that a strictly laissez-faire attitude has grown up in surgical as well as pædiatric circles. Some hearsay clichés look like being hallowed into established rules. Examples are: "Never operate on an athetoid", and "It's no use operating on spastics because they can't cooperate in aftercare."

Anyone looking for real evidence for these and similar "truths" will be astonished to find that Britain has no organised body of knowledge or experience on which to draw for this information. In this we lag far behind our colleagues in the United States, where a considerable amount of experience is being accumulated on the basis of work done in surgical units specialising in this problem. This is a sad thought when we recall that W. J. LITTLE gave the study of cerebral palsy in England so fine a start in the paper republished in the first number of this *Bulletin*.

There is now an urgent need of a systematic programme to study the possibilities and limitations of surgical methods for the improvement of limb deformities in cerebral palsy, which could in time produce results comparable to those achieved in dealing with the effects of poliomyelitis. The programme of vaccination against poliomyelitis should re-

lease the surgical skills and time for this purpose in the not too distant future.

The time has come to re-evaluate the indications and surgical techniques, on the basis of recent advances in the diagnostic niceties and classification of cerebral palsy, and the considerable experience gained in reconstructive surgery for the effects of poliomyelitis. Apart from greatly benefiting individual patients, such work should throw new light on the clinical pathology of cerebral palsy. For, in another field, surgery has brought new hope and relief to thousands of sufferers from chronic heart disease and at the same time has modified and expanded our knowledge of the pathology of cardiac disorders.

A plan to develop organised surgical treatment for the effects of cerebral palsy need be neither large nor ambitious providing it has long-term stability. As the general level of knowledge of the disorder increases, new operations will suggest themselves and surgical techniques will improve. Improved record-keeping, and in particular the use of cinema filming to record function, will help to make the indications for surgery more definite and its results more predictable.

Lipmann Kessel.

WAS LITTLE RIGHT?

IN the ten years or so immediately before Little dropped his learned bombshell great minds had become increasingly busy on ordered and disordered physiological processes. Addison on the suprarenals; Claude Bernard on glycosuria following puncture of the fourth ventricle; John Snow on water-borne cholera; Helmholtz on the velocity of nerve currents; Waller on degeneration of spinal nerves; the invention of the ophthalmoscope; the establishment of the Hospital for Sick Children in Great Ormond Street; Virchow on neuroglia; Kékulé on the carbon atom; solid walls had been shown to allow the permeation of air; Brown-Séquard on unilateral paralysis with crossed anæsthesia; Landry on ascending paralysis; Pflüger on electrotonus; Duchenne on bulbar paralysis; and Schultze on resuscitating asphyxiated infants—with these and many other ideas flowing, there is no doubt that between Little's foundation of the Royal Orthopaedic Hospital in 1837 and his address to the London Obstetrical Society in 1861, he had seen, examined, and pondered over many cases of "cerebral palsy." In these 24 years he had evolved from the simple noting of deformities to asking himself more and more "the reason why." He had not been content to go on "treating" without making greater and better efforts to understand what he was trying to treat. By 1861 he was a mature general physician who spread his mind over the great tracts of evolving medicine: others had shown him with growing clarity the dangers arising from disease or injury in the nervous system. It is highly significant that W. J. L. was also a visiting-physician to the Asylum for Idiots, Earlswood. Thus for him the "deformities" and "cerebral incapacities" came to occupy their true forms and places.

Little knew that the fœtus is subject to diseases similar to those which afflict the economy at later periods of existence: he had an insight into fœtal pathology such as no doubt stirred the interests of the great J. W. Ballantyne some forty years afterwards. The period of birth is an epoch of existence so different from those that precede and follow it that any untoward influences might well have unique effects at that time. Little was putting the matter

one way; Clement Smith put it another when he recently enclosed the same affairs of birth in the phase of "the valley of the shadow of birth." Each, in their own phrases, imply the possibility of "serious and peculiar evils" in these circumstances. The famous obstetetrician, William Smellie (*c.* 1750), painstakingly described the conditions of stillbirth and suspended animation and apoplexy of the newborn, but he and others of his time were almost conspicuously silent on the consequences to the infant and child who survived. W. J. L. searched the literature and could find only Duge distinctly relating "hemiphlegia and idiocy" to an injury received at birth: all others seemed to adhere to the same fallacy—that the mishaps of birth must lead either to death or recovery; the notion that such mishaps might cause defects extending throughout life struck nobody.

Dr. Charles West, founder of the London Obstetrical Society, who delivered a Lumleian Lecture at the Royal College of Physicians of London on nervous disorders in children, could neither confirm nor deny W. J. L.'s views, because "instances of such termination of abnormal labour had not fallen under his notice." But Little insisted that he had seen many cases of mental and physical deformity traceable to causes operative at birth. He would not move from this central clinical idea, and he told the Obstetrical Society so in no uncertain terms. His reasoning was sound and clear:

"The materials for its nutrition, oxygenation of its blood, being provided for by the intercourse which takes place between its blood and that of the mother at the placenta. The fœtus, during the uterine contractions, especially after evacuation of liquor amnii, is subjected, together with the placenta, to a gradually increasing amount of pressure. This pressure is at first intermittent, the duration of the period of repose at first greatly exceeding the period of disturbance; as the final exit approaches, the pressure simply remits, until at length it is so considerable that prompt escape from the mother alone prevents mischievous results to the nascent organism. During the uterine contractions a certain amount of impediment to placental respiration is unavoidable. The normal impediment to placental interchange reaches its maximum at the moment of birth. Should any departure from the normal act of birth take place, should the act of normal respiration not be established at the moment of birth, . . . reflection on the nature of a delay of only a few moments in the substitution of pulmonary for the ceased placental respiration would lead to the apprehension that even the want of a few breathings, if not fatal to the economy, may imprint a lasting injury upon it. If pulmonary respiration be not immediately established, asphyxia neonatorum takes place. We may direct our thoughts to the necessary consequences of blood stagnation in the sinuses of the brain, and the venous plexuses surrounding the spinal cord. We can apprehend the inevitable congestions of the capillary system of the brain and spinal cord, and the mischievous circle of affairs if this is not relieved by suitable respiration."

Sometimes W. J. L. confused cause and effect. Thus, he thought that atelectasia pulmonum, or a heart strained and injured at birth, might produce anomalous affections of the lungs or heart in after life or render these organs more prone to adult disorders. And he wondered if some cases of "congenital" cyanosis were induced at birth. Even here, though, he may not always have been far out in his ideas. Lung fibrosis and ectasia may derive ultimately from atelectasia: and it is not impossible that persistent patency of the ductus arteriosus (with possibly reversed flow then) may arise from "inducements at birth through impediment at this period to the normal substitution of the infantile for the fœtal circulation." Little may have been unduly teleological in thinking that some "ailments in the abdominal viscera" presenting themselves in early life are due to similar causes. Doubtless Little saw countless possibilities arising from a disordered "general capillary system" in asphyxia neonatorum. He even extended these to possible affections of the peripheral nerves

and the muscles, and hence gradually completed the circle from the central nervous system through to the peripheral parts in building up his conception of injurious influences.

Was Little right? This clinical story of his suggests that he was and also that he recognised the particular and special dangers of prematurity to the brain.

"Child first seen . . . at age of three years presenting spastic contraction of flexors and adductors of lower extremities. Hands never affected. No atrophy. Unable to stand or walk.

History: First child. Child born after six omissions of catamenia, supposed at 'ten weeks before proper time; had no nails.' Labour lasted two days. Mother confined without assistance, because birth was 'quick at the last.' Was a quarter of an hour without assistance. Child did not cry until removed from mother; was black for days, certainly was so for three days; was thought to be dead when put into hot bath; took breast after third day; used to choke with the least thing. During first ten days was 'drawn' about the face, and 'nurse used to think that he would never get breath again.' Was 'startlish.' Had distinct convulsions from second to fifth or sixth week.

Seems intelligent; but mother reports he can only say 'mamma, baby, and a few other words.' Has lately improved. Imitates other children; crawls after ball and throws it. High prominent broad forehead. Left limb reported stiffer than the right, but right is more contracted. Back round and prominent; increased when he is sitting on floor and poplitea are made to touch floor. When prone, back is straight. July 1860: legs cross. Legs relatively short. Can walk round chair, holding on to it. June 1861: has picked up many words."

Little found himself in difficulties in reasoning from birth or antenatal causes to the first appearance of signs of infantile spastic and paralytic contractions between the ages of six months and two years. He even thought, because of these time factors, that more cases might depend on causes other than abnormal birth or premature labour, so he was rather inclined to over-emphasise postnatal causes. He need not have been so modest in his views, or even so agreeable with the president of the obstetricians, who held oblique doubts about Little's notions on injury at birth. Even today, the clinical diagnosis of early cerebral palsy calls for skill, patience, care, and an awareness of the minimal indications of spasticity and possible pending deformity. We now know that many of the cases which Little considered as arising at six months of age in fact arise at birth but only reveal themselves in the later postnatal period by causing disordered maturation and function of the injured parts of the nervous system. Necropsies were seldom done on stillbirths or early neonatal deaths following "birth injury" in Little's time, but Dr. Gibb gave him some helpful support in the discussion of his paper to the Obstetrical Society. In particular Gibb recalled a case that came under his own observation:

" . . . After a lingering labour, a child was born with spastic rigidity of all the muscles on one side of the body; in fact, it was an instance of conjunctive hemiplegia. Suspecting that the cause existed in the brain, he was allowed to make an examination of the body of the infant, and found a clot in the substance of the brain on the side opposite to that on which the hemiplegia existed. The vessels generally were very much congested about the head, and, no doubt, had the child lived, it would have remained palsied."

Like many who seek the truth, and often find nearly the whole truth, Little consulted his Shakespeare, and he gained support from Richard III and his plight:

"Deform'd, unfinish'd, sent before my time
Into this breathing world, scarce half made up."

And this might bring us back to another idea—that some are born rich and some poor—in terms of biological states. Sometimes, no doubt, the "unfinished, sent before my time" may be a genetic or innate affair, and congenital abnormality must occasionally be considered. Some of Little's cases could be put in this group. But that in no way negatives his view that cerebral anoxia and "birth injury" are highly significant in the causation of cerebral palsy.

A. V. NEALE.

VALUE OF FILMS IN CEREBRAL PALSY CENTRES

A CONFERENCE AT GUY'S HOSPITAL

A short conference, organised jointly by the National Spastics Society and the Medical Committee of the Scientific Film Association, was held at Guy's Hospital, on October 19, 1957.

The papers read are summarised here with some of the points made in discussion.

There were about 30 participants, including doctors, heads of cerebral palsy centres and photographic experts. At the first of the two sessions the chair was taken by Dr. Ronald Mac Keith, vice-chairman of the S.F.A. Medical Committee, and at the second by Dr. Paul Polani.

Use of Films in Cerebral Palsy

By

DR. P. E. POLANI,
Director of Research, N.S.S.

Cerebral palsy is essentially a disturbance of voluntary movements and therefore lends itself to demonstration by films. The paucity, excess or deviation of patterns of voluntary movements are easily recorded by the ciné camera. But we must always ask ourselves our purpose in using it. Because it is technically easy to take a film, this by itself is not a sufficient reason for doing so. Cinematographic records are expensive, and making a good film is doubly expensive because *it also costs time.*

One purpose may be the collection of a large number of records of cases of cerebral palsy in order to classify the types of movement that they show. This is a clinical purpose. The film can be a more exact record than a verbal description and much safer than applying a shorthand label, such as athetosis, chorea or tremor, to the motor abnormality. It is to be remembered of course that the film will only show the movements; it cannot give any information on muscle tone or other elements necessary for a neurological diagnosis.

A second purpose might be as a routine supplement to the ordinary neurological examination. Such an indiscriminate use of the film appears to me unjustified. On the other hand, taking a film as a permanent record of the really odd or difficult case is a more justifiable procedure. The same applies to babies, in whom the clinical picture may change strikingly with the passage of time. The purpose of the film then is to build up a record of abnormal neurological patterns in babies. Later, when the infant has grown up, and shows a clearly recognisable type of cerebral palsy, we can revert to the original record and there, we hope, pick up the abnormalities which were the characteristic forerunners of the fully fledged neurological picture we now see in the older child. Thus the film taken in babyhood can help us with other babies—to forecast future neurological trouble and possibly its type. But it is to be remembered that a detailed clinical description *might* be used just as well as the film, and conversely that the film will not help us unless it has been taken with a specific object in mind; and also that the film cannot tell us anything about other abnormalities, such as muscle tone, that are not visible. But a film record when reinspected may reveal abnormalities of

posture, etc. that were not recognised at the original examination.

In these examples of the special case, the film contributes a useful promemoria for oneself, an aid to teaching or to convince the sceptic.

Frequently there is another pretext for taking a film of a patient with "cerebral palsy": to *show the effects of treatment* on the disturbance of movement; either in the desire to use the film to boost the patient's morale or more frequently the doctor's or the therapist's desire to rely on the film to assess the result of treatment. Striking changes of motor performance will, of course, be documented by the film, particularly if it is always taken with the idea of showing "maximum ability" of, say, manipulation, or locomotion etc. But frequently changes after treatment are small, and, whether the improvement takes place through reduction of rigidity or diminution of unwanted movements, are reflected merely in slight improvement of the time of performance of a given motor task. If speed of movements is what we want to measure, or improvement in speed following treatment, I wonder whether the film is the best way of doing it. Or, if the film must be used, then I think it should be standardised so as to allow measurements of speed and distance to be taken from the cinematographic records, so that we can express quantitatively the improvement of willed motion. And, again, the film should be applied to a stereotyped movement, a relatively simple one that lends itself to accurate analysis and measurement.

In conclusion, and to state the obvious, the essential point in the scientific use of films is to have a very clear objective in mind before the film is taken. Having decided on the reasons for taking the film, the technique of taking it and the subsequent use of the cinematographic record will have to be decided.

One last point. If we wish to use films for any purposes beyond the worthy, but unscientific, one of inclusion in the family album, and particularly if we wish to pool information from various centres, I should like to plead for *standardisation* of size, material, illumination, processing, and any other variables which occur to you.

Difficulties and Successes in the Use of Films

By

DR. K. T. NICHOLLS PALMER,
Consultant in Physical Medicine, Colchester Group Hospital Management Committee and Prested Hall Adult Centre, N.S.S.

Photography has four variants which have been found useful in our work at Prested Hall:

(1) Still black-and-white photographs.
(2) Still colour transparencies.
(3) Ciné black-and-white.
(4) Ciné colour.

1. Still black-and-white photographs are taken of each resident, undressed at a fixed distance, A.P. and lateral, standing or supported. They are taken with natural lighting in the treatment unit with a very ordinary camera. These are most useful as a record in the patient's notes. They are a great aid to memory when going through the patient's notes without the patient.

2. Colour transparancies are, I think, the easiest method of taking good pictures. I have found them invaluable for illustrating lectures and for entertaining the residents, showing them how well they appear playing games and taking part in various activities. (The two examples shown were taken with a 35 mm. Retina camera with natural lighting. A flash may be used very easily and does not require expensive equipment.)

3. Black-and-white ciné is used for clinical record purposes. Each resident is asked to perform certain tasks within his or her capability. Dressed in gym shorts

they get up from the floor, walk or crawl to a seat, and sit down; they then get up and walk to a table (if necessary using a walking machine or propelling a wheel chair); they sit down, spread some bread and butter and eat one mouthful and drink from a cup. The record of their movements can, if necessary, be shown in slow motion and a brief analysis made. These films were started nearly two years ago and I have no doubt they will in time be modified. (The photographs shown were taken with a Bell and Howell 16 mm. magazine-loading camera, on a firm tripod with a pan and tilt head.)

4. We are in the process of making a coloured ciné film showing life at Prested Hall.

Conclusion

This is the use made of films in one of the N.S.S. centres. There have been difficulties. Film stars are always temperamental and the spastic resident is no exception. But to my mind the camera and the ciné camera have already been useful to us. Probably we could make still better use of them.

Comment: Dr. Nicholls Palmer showed still photographs, colour transparencies and films in black-and-white and colour. The black-and-white films were simple records of patients getting up from the floor and moving to a chair and then the same patient doing a simple everyday procedure such as eating. Though simple, they seemed extremely valuable records of the patient's "maximum abilities". One comment made was that it was good to see records of patients doing things *for themselves* and not having things done to them by therapists.

The colour film showed various activities at Prested Hall and illustrated well how valuable film could be for arousing interest in work for cerebral palsied people and for giving a stimulus to patients.

Film Facilities in Cerebral Palsy Centres

By

DR. C. P. STEVENS,
Director, N.S.S.

The N.S.S. has from the start recognised the value of film records and has so far supplied five of its National schools and centres with cinema equipment—i.e., Prested Hall, Thomas Delarue, Craig-y-Parc, Wilfred Pickles, Irton Hall. Equipment is to be supplied to Hawksworth Hall, Sherrards and Coombe Farm if it is required by the consultants in charge.

The equipment used varies in detail from centre to centre, but each has the basic necessities—a 16 mm. ciné camera and a projector. The extent to which film records are made, and the precise nature of the records varies, presumably because each consultant holds his own opinion on the relative value of filmed records. For example, at the Craig-y-Parc School each child is filmed on admission and special "shots" are taken of the particular feature or features of the disability which the consultant considers may improve with physiotherapy. After a lapse of 6-9 months from the time of the first filming a further record is made. If a particular child is making very rapid progress, records are made more frequently.

At the Wilfred Pickles School, on the other hand, filming has been abandoned for the time being. Film records have been made of only some of the children at the school and, in any case, the use of film records is on a very small scale.

Film records are probably being used more extensively at Prested Hall Adult Centre than at any other school or centre. Each resident is photographed (still photo) once a year, and these photographs become part of the individual's dossier, providing a visual record. The ciné camera has been used for making movement studies—for example, a spastic using utensils during a meal. These studies are repeated some 6-12 months later—again

for the purpose of detecting improvement.

The Society has also provided equipment for Dr. Fisch, of the Royal National Throat, Nose and Ear Hospital, in his research into deafness in cerebral palsied children.

Conclusion: A great deal is being done in general, and film records appear to have proved their worth, but there seem to be no uniform procedures or techniques.

A central library and a co-ordinating and advice service for exchange of films and information seems highly desirable, and also integrated methods of making film records of people with cerebral palsy.

Relative Value of Kinetic and Static Records of the Analysis of Movements

By

C. E. ENGEL, F.R.P.S.,
Director, Department of Medical Illustration (Photographic),
Guy's Hospital Medical School.

It is more important for the clinician or therapist to have a clear idea of what he wants to do by the use of film than of how to do it with this aid. Two separate problems are attacked by using cinematic methods:

(a) General observation of behaviour. Film records are obviously very suitable for refreshing the memory of how the patient looked at some moment in the past. But the observer will get only a subjective impression from the film record.

(b) A detailed record of movements made so that they may be measured and directly compared.

To both problems certain points are applicable:

Standardisation.

The patient should be doing the same movement each time of recording and it should be recorded with the same viewpoint, distance and speed of filming. It is possible to have a true record in two dimensions. This may be attempted by recording simultaneously from two directions at 90° to each other.

Methods of Recording on Film.

For *straight filming* at either 16 or 24 frames per second, black-and-white film is useful and is sensitive enough for use without special high-intensity lighting. It is of course cheaper than colour stock.

Slowed-motion filming, where the film is run at 32/64 or more frames per second while filming and then projected at 16 or 24 frames per second, slows the patient's movements and gives an opportunity for analysing. Special lights and more film material will be needed, and for the higher degrees of slowing special cameras will be necessary, though many ordinary cameras will do 64 frames per second.

Time-lapse movements, in which the frames are exposed at less than 16 frames per second and then projected faster than they were taken, compresses a long period of action into a short projection time. This may not have much application in cerebral palsy work. However, a lengthy procedure—e.g., an athetoid boy attempting to dress himself—could be recorded by obtaining only one picture in every second. This would furnish a short length of film with all the essential stages of the procedure, short enough for comparison with other records of the same resident or with those of other patients. To make the recording of behaviour simpler, there are cameras with built-in automatic iris control which may be of great help to the amateur photographer.

Where the subject should not be influenced by the knowledge that filming is being carried out, a hidden camera can be used. It is then especially of advantage to use a model with built-in automatic

iris control. This ensures correct exposure irrespective of the fluctuation of embient illumination, within certain limits. An automatic exposure device would secure a constant sequence of exposures at predetermined intervals, so that the camera could be left unattended for long periods of time.

When the records come to be used there are various methods of projection:—

(1) Normal projection at the speed at which the film was taken.

(2) A brief record of a movement may be made into a loop and continuously projected, whereby the movement may be seen again and again. A German projector enables two such loops to be viewed alternatively at any desired moment by the simple operation of a lever.

(3) The analysing projector takes a record made at ordinary speed and projects it more slowly. This gives slowed motion (of a step-like nature) without the film record having been taken at high speed and gives an opportunity for frame-by-frame analysis.

The second problem is the detailed record of movements for assessment by measurement and direct comparison. For this, standardisation is essential and the field of view must be restricted. Any of the recording techniques already mentioned can be used. Analysis by superimposition of images and plotting the movement on graph-paper is lengthy. The curved line on a graph so obtained may be amenable to analysis, showing that an irregular movement is made up of two simpler movements. For such detailed analysis accuracy and stability of film, steadiness in the gaits of the camera and projector, and a sharp image on the screen are essential. Frame-by-frame plotting requires sharp images which can be obtained only by high-speed recording. Most of the simpler cameras do not arrest the film evenly when exposed at high speeds, so that the projected images do not superimpose. An alternative method would be to use a camera in which the film moves past the lens continuously at a predetermined speed. A continuous line can be recorded by attaching light bulbs to the limbs of the subject, who moves in a very subdued light. Alternatively, separate and sharp images can be recorded by using a stroboscope, which emits a flash at a set rate (e.g., once every 1/10 second, or once every second). Individual points, such as the elbow or wrist, can then be connected from image to image by a line drawn in indian ink to produce a simple curve with a known time scale.

Among the factors which have to be considered in comparing ways of making film records are relative economy, simplicity, ease of standardisation, ease of operation, and ease of analysis of the records.

Meeting the Needs of Clinicians and Therapists

By

DR. BRIAN STANFORD,
Chairman, Medical Group, Royal Photographic Society.

(Dr. Stanford reviewed the apparatus for film lighting, editing and projecting, and showed some examples.)

Magazine-loading cameras, though they sound attractive to amateurs, are expensive and liable to go wrong. Loading by spool is easy and 100 ft. lengths of film are very practical. The 16 mm. film is almost universally used at the moment. There are arguments for using 8 mm. film; the camera is smaller and the stock cheaper, but 8 mm. projectors are not so universally available. Money spent on good camera lenses is well spent; a 20 mm. and a 40 mm. lens is desirable. It is possible to get a lens which will shoot in ordinary lighting; this costs £100, but the powerful lights otherwise necessary

can easily cost £50 each. Weston Master light-meters are to be strongly recommended, for they do not tire.

It is rarely necessary to run the camera at speeds greater than 64 frames per second. Tripods should be as big and heavy as possible, and a spider base for the tripod is very useful. A number panel is a great help in identifying film records.

As regards lighting, filming may well be done out of doors as much as possible. Sunlight is especially valuable for high-speed work. Many projectors as purchased have relatively poor lenses and the quality of the picture depends on a good lens. A good splicing machine is well worth buying.

The N.S.S. might set up a central buying agency with benefit to its centres.

Discussion

The adult centre at Prested Hall seemed to be making most use of films, but in general films were more highly thought of by the personnel of schools than by those of adult centres. Mr. Pedder reported that at Wilfred Pickles' School they had tried a standardised system of recording various types of cerebral palsy and of progress and had found there was too much individual variation to make standardised tests profitable.

Dr. Nicholls Palmer agreed that standardisation was difficult but he suggested, and the meeting generally agreed, that his films showed how use could be made of simple records of "maximum achievements" in locomotion and occupation. The atmosphere at the time of filming is a very special one, but Mr. Currie remarked that the special excitement goes when the patient actually starts doing something.

An interesting point brought out was that on several occasions slowed-motion records of rapid movements had enabled *patients* to identify ways in which their movements had gone wrong and had therefore helped them to correct such errors.

Mr. Innes from Carlson House and other speakers emphasised the need for separating the separate purposes for which films could be used.

A very real problem is how to extract information from the accumulated records. This problem is not peculiar to film records but it is more difficult with films because they are not easily expressed in words, which make a convenient abstract for analysis. Information needs to be abstracted for recording progress or for making new discoveries. The "maximal achievement" emphasised by Dr. Polani was agreed to be a good point. It is possible to become discouraged by aiming at too perfect standardisation, and Dr. Nicholls Palmer's simple records are in fact very useful.

Among the sources of information available are the Head Office of the N.S.S., the Medical Committee of the S.F.A., the Medical Group of the R.P.S., and various individuals, some of them present at the conference, who have made a special study of the use of film.

Conclusions

The main lesson of this conference seems to be that strategy is more important than tactics. Knowing what you want to do must come before deciding how to do it.

The film can be used for:

(1) *Research.* (a) On movements, both for the physician and also at times for the patient to study himself. (b) On results of therapies.

(2) *Teaching.* (a) Teaching techniques to patients and therapists. (b) Conveying motivational attitudes. (c) Teaching students and doctors about C.P.

(3) *Morale boosting* for patients and staff.

(4) *Propaganda* and conveying information to lay people.

BOOKS—New and Not So New

THE EDUCABILITY OF CEREBRAL PALSIED CHILDREN. M. I. Dunsdon. London: National Foundation for Educational Research & Newnes Educational Publishing Co. 1951. *Reprinted* 1954, *pp.* 162. *Price* 21*s.*

This is an account of the first full-scale investigation into the educational provisions for cerebral palsied children in England and Wales. It is based on a research study carried out between 1946 and 1950. Miss Dunsdon describes her purpose as "to study the abilities and disabilities of cerebral palsied children in order that facts rather than assumptions and impressions only should provide a sound basis for the establishment of appropriate schemes for their educational care." This sets the key-note of her work. It is a careful and exhaustive study in which she remains objective and realistic throughout.

Miss Dunsdon's aim is to provide information and evidence on which educational provision for these children can suitably be planned, so the study begins with a survey of the incidence of cerebral palsy in this country and its distribution by the main descriptive categories and by sex.

She is mainly concerned with the psychological and educational aspects of these children's growth, but she recognises and demonstrates how closely their physical status—with all their varying handicaps and anomalies of maturing—is interwoven with their psychological and intellectual development, and she shows how this very sharply affects their educability.

The author herself made a careful psychological examination of some 900 cerebral palsied children and her judgments and recommendations are largely drawn from her intimate first-hand experience of this representative sample. She gave considerable thought to the problems that arise in trying to make satisfactory intellectual assessments of these children. Although the search for more reliable testing methods continues, much of Miss Dunsdon's work—for example, her emphasis on the need to understand the rationale of any test used—remains basic. Miss Dunsdon shows how intellectual growth is related to the extent and type of handicap; she also stresses the importance of distinguishing between speech failure and failure in verbal reasoning and usage in these children. Arising from her examination of the individual children, she relates her findings to the practical problems of teaching cerebral palsied children. She points out how a child who tests reasonably high on the Stanford-Binet scale may have difficulties, for instance, in the appreciation of spatial concepts, which seriously impede learning and baffle the teacher who is not aware of them. Throughout her discussion of the characteristic handicaps of cerebral palsied children she constantly throws out suggestions for changes in teaching methods which might provide a better approach to learning for children with specific disabilities.

Since this book was published much further study of the problems to which it was directed has been carried on by psychologists and teachers. Schools and centres with varying experimental approaches provide experience which modifies some of the views and suggestions for the organisation of provisions for cerebral palsied children in this country. Despite this, Miss Dunsdon's work forms a sound basis from which to move to further research on the educability of these handicapped children. Her book should still be regarded as essential reading for those who work directly with these children and also for administrators who have to provide suitable educational opportunities for the cerebral palsied children in their areas.

J. M. WILLIAMS

THE INFANTILE CEREBRAL PALSIES. Eirene Collis, W. R. F. Collis, W. Dunham, L. T. Hilliard, D. Lawson. *Foreword* by Sir Francis Walshe. *London*: *Heinemann*. 1956. *pp.* 100, 15*s*.

The purpose of this book is set out to be: " . . . defining the problems so that they may be clearly viewed. This is done mainly in terms of the experience of Mrs. Eirene Collis in the pioneer unit at Queen Mary's Hospital for Children over the past fourteen years". Many readers will be interested to learn what conclusions that unit has come to, and physiotherapists will find the detailed suggestions on treatment for various types of cerebral palsy very useful indeed. The emphasis on treatment of the child by the mother is excellent, and it would be well if we all wrote down for the mother a plan of what she is to do for her child in the way that schemes of management are given here.

One chapter gives quotations from William Little. Today his emphasis on perinatal factors seems excessive; it is noteworthy that Little referred not only to cases with spasticity but also to those with "a distinct resemblance to severe chorea".

In the chapter on diagnosis and management, the need for a comprehensive management of the child's problem, rather than for simply physiotherapy, is brought out well. After this there are chapters on five clinical pictures—generalised spasticity, hemiplegia, variable rigidity, athetoid cerebral palsy, and ataxia. In each case the clinical picture is described followed by a case-history, with a scheme of management in the form of advice to the mother. There follows a chapter on the organisation of cerebral palsy services.

The book rightly emphasises the desirability of recognising cerebral palsy at an early age, so it is a pity that the authors' ideas on how to differentiate between developmental delay from mental handicap and that due to cerebral palsy are not clearly set out. In the chapter on the "generalised spasticity" type of cerebral palsy, I find it puzzling that the grossly mentally defective hypotonic child is included and that he appears under the name "symmetric diplegia". A separate group of "atonic diplegia" seems to be needed for these children who are not spastic. Then I do not think the severely mentally handicapped are always hypotonic; they commonly are, but some are spastic. In my experience there is less correlation between intellectual capacity and the type of motor disorder than is stated here. For example, to say "the three-year-old child with athetoid cerebral palsy is not mentally limited" seems too emphatic a statement. Some are, some are not. Again, it is said that "true defects of sensation appear to be uncommon" in hemiplegia; this again seems an overstatement, for is not astereognosis relatively common? Of hemiplegias it is said that "There seems to be no relation between mental defect and the side on which there is hemiplegia". A number of authorities have reported mental defect as commoner with right-sided hemiplegia.

The figures given here represent the personal experiences of workers at one clinic, but it is clear that the cases are not representative—for example, of 31 cases with hemiplegia, 29 were mentally limited. And only 174 cases are analysed. More than that number must have been seen at the Clinic in 14 years.

The clinical picture of "variable rigidity" was found in 31 of the 174 cases. There is said to be usually a history either of prolonged neonatal jaundice or of anoxia. I suspect that a large proportion of these go on to develop choreo-athetoid movements later, but such a possibility is not referred to here. It is very surprising to read that in athetoid cerebral palsy "there is always a history of abnormal birth." Surely quite a large proportion of these (until the last few years) followed neonatal jaundice either from iso-immun-

isation (Rh.) disorder or prematurity?

Ataxic cerebral palsy is rightly described as a rare form. The authors found 4 in their 174 cases. The trend of the book towards over-simplication of the diagnostic problems is revealed by there being no chapter on mixed forms.

The detail of the numbers in table I seems to me rather misplaced, since column 3 is based on an assumption, possibly correct, but certainly a crude approximation.

This book is welcome as giving the views of one unit that did noble pioneer work in this country. It is well produced. It helps towards the physiotherapy of children with cerebral palsy in three ways —it emphasises the essential part to be played by the mother in such treatment; it shows how instructions for her can be set out; and it gives in detail the exercises and manoeuvres to be done.

R. C. MAC KEITH

A PSYCHOLOGICAL STUDY OF A CITY'S CEREBRAL PALSIED CHILDREN. Ella B. Floyer, M.A., Dipl.Ed. Formerly Educational Psychologist, Liverpool Education Committee. *London: British Council for the Welfare of Spastics*, 1955, *pp.* 88, 3*s.* 6*d.*

This monograph is written primarily for doctors, psychologists, teachers and other professional workers interested in the psychological and educational problems of cerebral palsied children.

In her account of a survey of 164 cerebral palsied children in Liverpool, Mrs. Floyer's main findings support those of the other English workers, Dunsdon, Asher and Schonell. However, Mrs. Floyer does add useful new information—for example, her analysis of the educational placement of the 120 educable children in her sample, 50% of whom "were able sooner or later to be educated in ordinary schools". This book should be read carefully and critically by psychologists; for some of its more valuable remarks are not given full emphasis. Thus, in discussing the supposed prevalence of visuspatial disabilities among cerebral palsied children, Mrs. Floyer points out that the educational implications of such a disability are not known. This is an important point with an application beyond its immediate context.

The survey was done in March, 1950. Knowledge on the testing of handicapped children and young children has increased considerably since that time and this should be remembered in evaluating Mrs. Floyer's survey. In general, greater knowledge has led to greater caution in the interpretation of conventional intelligence-test results obtained from handicapped children. Mrs. Floyer's survey is an accurate and careful piece of work, but her findings require some re-interpretation by psychologists in the light of new knowledge, not only of the psychological studies of the cerebral palsied but of allied work on other categories of handicapped children and of psychological testing theory and practice. It has been pointed out that advances in the medical treatment of the cerebral palsied are partly dependent on advances in other fields of medicine; so advances in the psychological and educational treatment of the cerebral palsied are dependent on advances in general psychology.

The pamphlet contains much to interest psychologists: it is in the tradition of Dunsdon and Schonell in this country and of Bice, Hopkins and McIntyre in America. Perhaps the main contribution of these workers to the problem of cerebral palsy is their demonstration that at least 40% of cerebral palsied children come within the normal range of intelligence. The main defect of these studies, in the light of modern knowledge, seems to be some lack of caution in interpreting their results.

J. E. M. STEPHEN.

CEREBRAL PALSY. *Advance in Understanding and Care.* Viola E. Cardwell. New York: Association for the Aid of Crippled Children. 1956. *pp.* 625, £2.

This is a very good book. There is nothing comparable published in England. The first 110 pages provide a review of the medical background and of diagnosis; rehabilitation of the individual occupies 350 pages and community aspects 140 pages. There is a chapter on the anatomy of the central nervous system, in which some of the illustrations could be improved. (Fig. 5 is really intelligible only to someone who already knows what is set out here.) Facilitation and inhibition from the cortex, the reticular system, and the cerebellum are discussed. Early recognition in the first year is referred to.

Altogether, the section on medical aspects, including diagnosis, is the best review of this subject I have read. The sections on treatment cover this subject well. The need for helping the whole child is made very clear. Although community agencies are different from ours, the child's needs are equally manifold in this country and there is much to be learnt from this account. There is an excellent review of the various schools of physiotherapy, which clinicians will find particularly useful.

R. C. MAC KEITH

MANAGEMENT OF THE HANDICAPPED CHILD. *Diagnosis, Treatment and Rehabilitation.* H. Michal-Smith. *Foreword* by Arnold Gesell. New York: Grune and Stratton, 1957. *pp.* 270, £2 6*s*.

This book has 13 chapters on children with different handicaps. The one on neuromuscular diseases covers cerebral palsy, poliomyelitis, spina bifida and myopathy and is not therefore very detailed. The value of a good attitude and approach to treatment and rehabilitation is very well conveyed.

The book reviews a dozen important problems in pædiatrics and will be found very useful as well as easy to read.

R. C. MAC KEITH

THE YOUNG HANDICAPPED CHILD. Educational Guidance for the Young, Blind, Cerebral Palsied and Deaf Child. Agatha H. Bowley, Ph.D., F.B.Psy.S. *With a section on* The Young Deaf Child by L. Gardner, B.Sc., D.Ed., D.Psy. *Edinburgh and London: Livingstone. pp.* 128, *with* 36 *ills.* 10*s* 6*d*.

This small book is good value and the whole of it deserves to be read even by those whose chief interest lies in learning how to help cerebral palsied children and their parents. For two reasons, first because in all the sections the advice is based on an analysis of the child's particular handicap, and secondly because cerebral palsy children can be deaf or blind as well as having locomotor defects. The book deals with young children in a practical way and is intended for the ordinary parent and teacher. It should be read by health visitors, general practitioners, and medical officers of infant and child-welfare clinics, even if each of them has only one or two handicapped children in their care, for the family attitude to the child will depend largely on how their first reactions to knowing that their child is handicapped are handled. The consultant children's physician can do much good by knowing the contents of this book. He is the person who has to confirm the parents' fears, and if he knows the book he can give constructive advice on what the parents can do forthwith—and he can introduce the book to the parents.

The brief section on causation of cerebral palsy needs revision by a doctor. Is rhesus incompatibility, apart from jaundice, of any causative significance, even if it is "commonly reported"? Conversely,

a history of prematurity is found in a third of all cases and is probably contributory in far more than "a few cases". Surely even in so brief a section perinatal causes deserve a sentence or two.

I think it is fair to say that most children's physicians and others specially interested in cerebral palsy would agree that ataxic cerebral palsy is too rare to deserve mention at this level. That is to say, cases with movement disturbances resembling those seen in cerebellar disorders are rare. Of course many children with muscular weakness will show "poor body balance, an unsteady walk, and difficulties in hand and eye coordination and control", but these are seen in many spastic diplegics and athetoid cerebral palsy cases. (Sir Charles Symonds remarked seven or eight years ago that the commonest neurological error of the pædiatrician was to label the child with early myopathy as having a cerebellar disorder).

If the sections on causation and classification seem to need revision, they are brief and any defect there may be in them does not spoil the many parts which give guidance to parents and others in helping and teaching children with cerebral palsy.

These parts of the book deserve warm recommendation. They are practical and sensible and based on explanations. They are reinforced by the last two chapters on "The Growth of Human Relationships" and on "Overcoming Adversity."

Even though the book deals primarily with the young handicapped child, teachers of older cerebral palsied children right up to school-leaving age will find it very helpful in understanding the physical, intellectual and emotional difficulties of handicapped children—and of their parents.

R. C. MAC KEITH.

EDUCATING SPASTIC CHILDREN.

E. Eleanor Schonell, M.A., Ph.D. *London and Edinburgh: Oliver and Boyd.* 1956. *pp.* 242, 21*s.*

This book deals with the various theoretical and practical aspects of the education of children with infantile cerebral palsy. It gives us the benefit of the author's ten years' experience with spastics in Australia, New Zealand, Canada and the U.S.A., but primarily in England—at Carlson House School, Birmingham. In the first part of the book the problem is explained and the historical background of educating spastics considered. Next the Birmingham research project is briefly described and Dr. Schonell gives details of the intellectual assessment, and various correlations of this with degree of physical handicap, reading ability, and type of cerebral palsy. In the third section she deals with the practical aspects of educating spastics; first with the general educational provisions and then with the educational problems of Carlson House in detail. There is a special chapter on the teaching of reading and arithmetic. In the fourth part of the book psychological and social aspects are considered.

Looking at the future, Dr. Schonell pleads for earlier and closer integration between vocational training and education in the case of the educable spastic; for greater efforts for spastics of subnormal intelligence, particularly those who are trainable; for study of the problems of the cerebral palsied adult; for research into the psychological and intellectual methods. Now, when there is a heightened interest in children with cerebral palsy, and increased educational provisions are being made for them, this book should be welcomed by all workers in the field, and particularly educationists, as supplying a great deal of interesting and useful material.

PAUL E. POLANI